REMARKS

The counsel on behalf of the Applicants would like to thank the Examiner for his time and consideration during the interview of November 29, 2005.

A supplemental Information Disclosure Statement has been filed with this submission for your consideration.

Specification

The paragraphs beginning at page 13, line 13 and ending on page 13, line 21 have been amended to include the units for the Vaughan Solubility Parameter. Support for this amendment can be found in the article "Solubility, Effects in Product, Package, Penetration and Preservation", C. D. Vaughan, Cosmetics and Toiletries, Vol. 103, p 47-69, Oct. 1988, incorporated by reference within the specification. A copy of the article has been enclosed with this amendment.

Claim Status

Claims 1-20 and 22-39 are pending in the present application.

Claims 21 and 40 have been canceled.

Claims 1-20 and 22-39 have been amended to recite a personal cleansing article comprising a package containing striped personal cleansing composition. Support for the amendment is found at page 3, lines 16-18; page 21, lines 16-20, page 26, lines 1-4, page 27, lines 9-12 and page 28, lines 7-10 of the specification. Claims 1 and 2 have been amended to recite that the cleansing phase and said benefit phase are in physical contact within the package. Support for the amendment is found at page 1, lines 12-14 and page 2, lines 9-16 of the specification. Claims 1 and 2 have also been amended to recite the units for the Vaughan Solubility Parameter as $(cal/cm^3)^{0.5}$. Support for this amendment can be found in the article "Solubility, Effects in Product, Package, Penetration and Preservation", *C. D. Vaughan, Cosmetics and Toiletries,* Vol. 103, p 47-69, Oct. 1988, incorporated by reference within the specification.

Claims 6, 7, 13, 14, 15, 16, 18, 19, 20, 25, 26, 30, 31, 32, 33, 34, 35, and 37 have also been amended for clarity.

Claims 19 and 39 have also been amended to recite that the package containing the striped personal care composition is transparent. Support for this amendment can be found in original Claim 20 and in the specification on page 21, lines 16-18.

It is believed these changes do not involve any introduction of new matter. Consequently, entry of these changes is believed to be in order and is respectfully requested.

Rejection Under 35 USC §103(a) Over St. Lewis, et al. (U.S. Patent No. 6,306, 806)

Claims 1-20 and 22-39 have been rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,306,806 issued to St. Lewis, et al. (hereinafter "St. Lewis"). The Office Action stated that St. Lewis disclosed a liquid personal care composition a dual chamber dispenser wherein more than two stripes may be dispensed comprising a surfactant, structurant, electrolytes and other adjunct materials. The Office Action further stated that St. Lewis taught the inclusion of a benefit stripe that is a water-in-oil emulsion comprising topically active materials and oils. The Office Action states that St. Lewis does not teach with sufficient specificity each of the claimed ingredients. The Office Action concludes that it would have been obvious to one skilled in the art at the time of the invention was made to combine the ingredients with reasonable expectation of success to formulate the claimed invention, in the absence of showing of a contrary, because each of the ingredients are taught in a single composition.

Applicants respectfully traverse this rejection based on the amendment and remarks contained herein.

St. Lewis does not teach or suggest all of the claim limitations of Claims 1-20 and 22-39 and, therefore, does not establish a *prima facie* case of obviousness. "To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." MPEP § 2143.03 citing *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." MPEP § 2143.03 citing *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Specifically, St. Lewis does not teach or suggest a personal cleansing article comprising a package containing a striped personal cleansing composition comprising a cleansing phase and a benefit phase which are in physical contact within the package. Instead, St. Lewis teaches a dual chamber package that keeps its surfactant stripe and benefit stripe physically separated in its package.

Accordingly, Applicants submit that Claims 1-20 and 22-39 are nonobvious over St. Lewis.

Conclusion

In light of the above remarks, it is requested that the Examiner reconsider and withdraw the rejection under 35 USC §103. Early and favorable action in the case is respectfully requested.

This amendment represents an earnest effort to place the application in proper form and to distinguish the invention as now claimed from the applied reference. In view of the foregoing, reconsideration of this application, entry of the amendments presented herein, and allowance of Claims 1-20 and 22-39 is respectfully requested.

Respectfully Submitted,

THE PROCTER & GAMBLE COMPANY

By Bridget Murray

Bridget Murray
Registration No. 52,555
(513) 626-0575

December 5, 2005
Customer No. 27752

Solubility
Effects In
Product, Package, Penetration, And Preservation

by Christopher D. Vaughan, Ultimate Contract Packaging Inc.
Pompano Beach, FL

Molecule to molecule attractions produce both solubility and insolubility in mixtures. They also drive many other interactions important to the suitability of cosmetic products for consumer acceptance. This article covers a few of the most obvious interactions. We describe how to generally predict areas where compatibilities may be a problem, by using solubility parameters. The same technique can be used to provide solutions to these problems.

Dissolving rarely happens directly. With the exception of acid/base interactions, it is always the result of a close match in the cohesive energy of the materials. Only when two materials have fields similar in strength does spontaneous mixing, or dissolution occur.

A mismatch in the cohesive energies of intermixed materials causes coalescence. The materials with the stronger cohesive forces will tend to coalesce, squeezing out the other material which will either float to the surface, or sink to the bottom, depending on its density relative to the material with the stronger cohesive energy.

The spontaneous separation of oil and water is a good example of these mechanics. Each water molecule has such a strong attractive field that the weak oil fields cannot compete with the water-to-water molecular attraction. Each water droplet attracts other water droplets so strongly that the oil is excluded and left to form a separated phase. These mechanics depicted in figure 1 are exaggerated and occur rapidly with

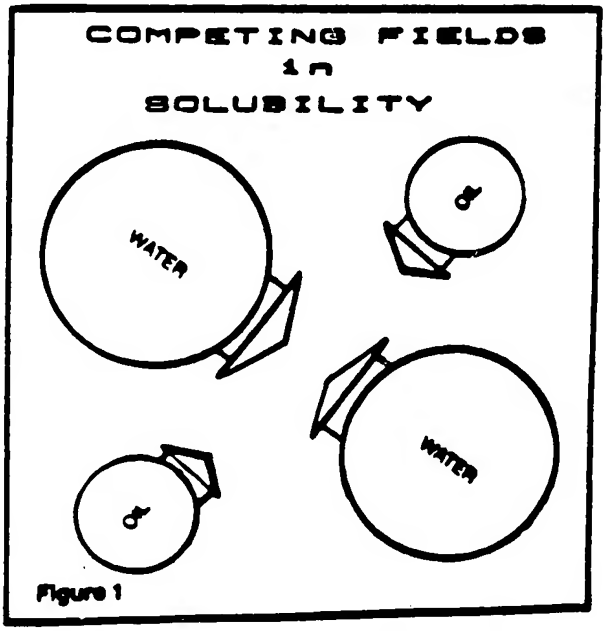

Figure 1

0361-4387/88/0010-4701$03.00/0

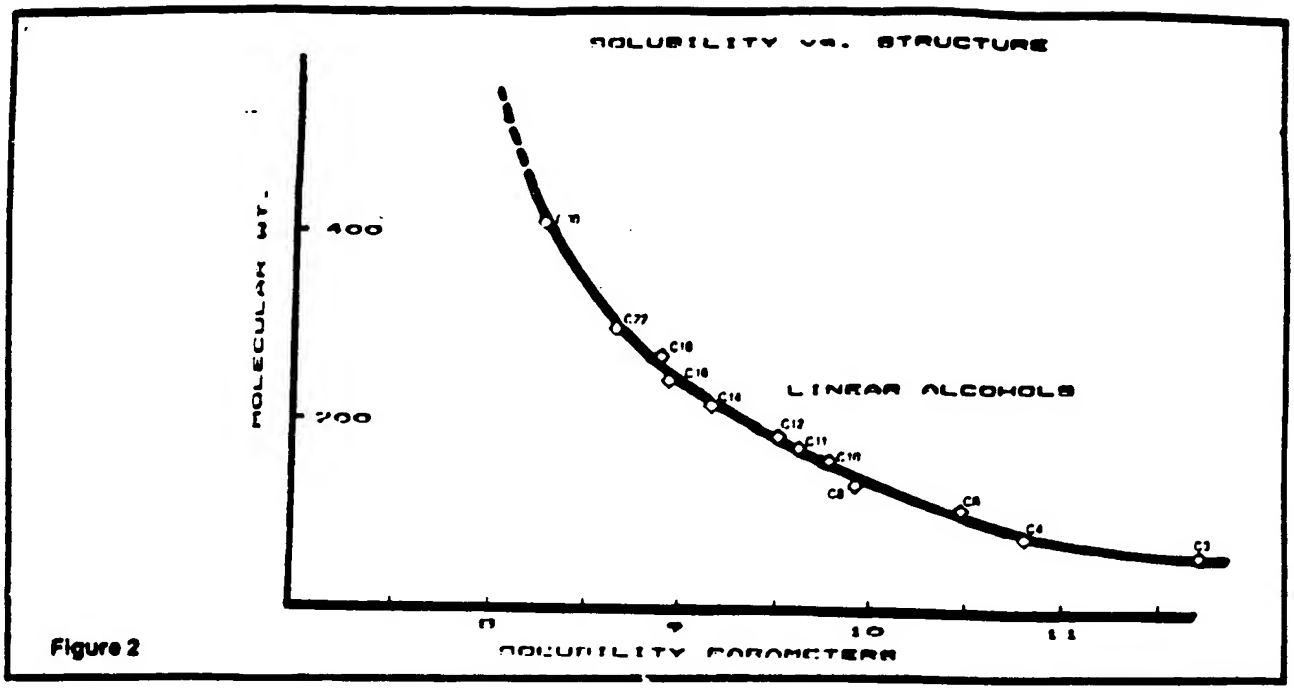

Figure 2

drastically differing materials like oil and water. However, even in systems with more similar materials, the same thing happens. Dweck recently reported that in lipstick, exuded oil droplets often called "sweat" are composed primarily of castor oil.[1] Castor oil is usually the most "polar" or cohesive lipstick ingredient. Thus this sweating, or syneresis, appears to follow the general mechanics of solubility. This begins to demonstrate how the adage "like dissolves like" remains valid for the broad range of physical, chemical and biological systems.

In Mixing – What is "Like?"

How to measure alikeness of materials has been a major challenge in materials science, chemistry, biology, and cosmetic science. The accepted scientific answer in the past has been "polarity." However "polarity" when measured as dipole moment or dielectric constant failed completely to explain the interactions of materials with zero dipole moment (electrically balanced molecules)! It was soon discovered that there was more to cohesion than charge attraction. In 1950, the London Dispersion Force on each molecule was added to the charge "polarity," by Hildebrand,[2] and the Hydrogen Bond attractions included, to give a polarity system which for the first time gave workable predictive solubility values. Hildebrand called these values "solubility parameters."

What is a Solubility Parameter?

The total sum of all the attractive forces radiating out from a molecule is its solubility parameter measured in (cal/cc.)$^{\frac{1}{2}}$. However for materials commonly met in cosmetic formulations, the solubility parameter is a scale of numbers going from around 5 to 25 (cal/cc.)$^{\frac{1}{2}}$, with oil-like materials toward the low end and water-like materials toward the high end. The family of aliphatic (straight chain) alcohols in figure 2 spans much of the solubility parameter range as it goes from water-like short chains to oil-like long chains.

The solubility parameter can be calculated several ways from physical constants (boiling point, molecular weight, density, etc.). The most common methods of calculation, from Heat of Vaporization and from Hildebrand's Equation give comparable results for most materials, as

Table I.

Comparison of two calculation methods

Compound	Solubility (ΔHv/V)1/2	Parameter SOLPARAM
Benzoic Acid	12.57	12.17
d-Camphor	9.35	9.45
Carbon Dioxide	11.39	7.53
Cetyl Alcohol	8.39	8.94
Citronellal	8.77	8.83
Dipropylene Glyco	11.95	11.52
Geraniol	10.40	10.21
Limonene	8.06	8.33
Palmitic Acid	7.65	7.89
Phenol	13.03	12.79
Phthalide	10.90	11.78
Pyridine	10.94	10.30
Menthol	12.62	12.72
Tridecane	7.30	7.49
Trimethyl Citrate	9.33	9.39
Vanillin	11.79	12.34

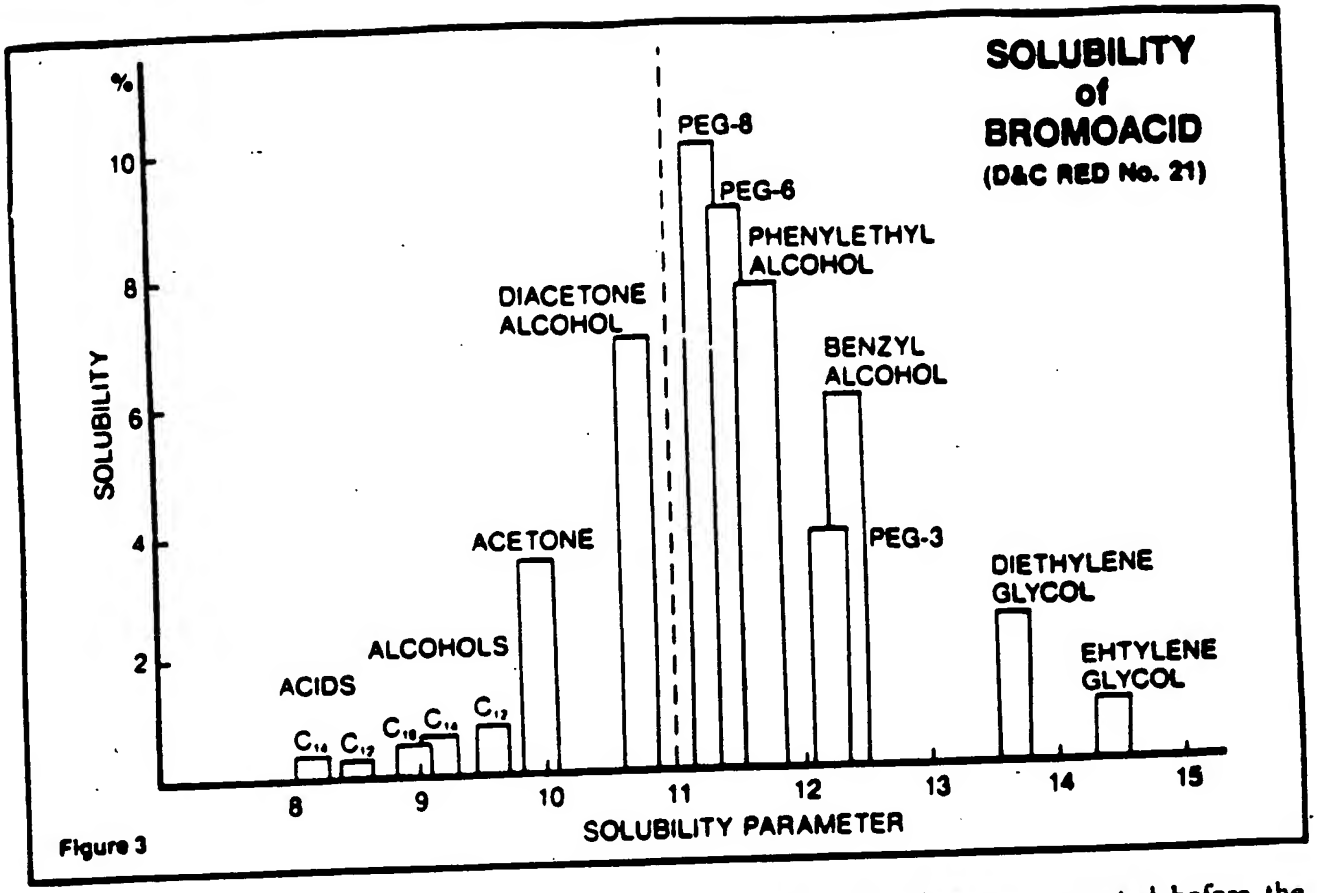

Figure 3

shown in table I. Materials with acid/base potential show the most variation.

The solubility parameter may also be determined by a solubility study.[3] Both methods are tedious.

It is always easier to look things up than to figure them out yourself. This is especially true with solubility parameters, many of which have already been published. Several suppliers to the coatings and plastics fields have determined the solubility parameters of their products. Also pharmaceutical researchers have published values for many actives. Many of these values have been compiled, as well as some new results that were determined empirically, or calculated based on physical data from manufacturers.

Our list of 440 materials (at the end of this article), provides the most comprehensive thermodynamic treatment of pharmaceutical, cosmetic, and fragrance ingredients published to date.

Uses For the Solubility Parameter

Solubility can be predicted quantitatively by so-called "Regular Solution Theory," however, the calculation time is rarely worth the effort since fairly accurate estimates can be deduced by inspection and comparison of solubility parameters. The example below of the solubility of Bromoacid (D&C Red No. 21) is from data published in the TGA Journal in 1944,[4] but this time the solvents are arranged by order of solubility parameter. This data set, generated before the discovery of the solubility parameter concept, provides an unbiased example of its utility. Conversely, the new treatment serves to validate the original study. The solubility parameter of Bromoacid is 11.20 (cal./cc.).[4] Figure 3 shows clearly how solvents for Bromoacid become more and more effective as their solubility parameters approach 11.20. This is "like dissolves like" in its purest form, and applies to all solvent/solute relationships.

The solubility of ethylene oxide is likewise presented from previously published but more recent data.[5] This data becomes much more meaningful when presented with respect to the solubility parameters of the solvents. The solubility parameter of ethylene oxide (E.O.) is calculated to be 9.93 and the range of its best solvents is from 8.5 to about 12.5. The author of the ethylene oxide study expressed concerns over residual E.O. from sterilization of raw materials and packaging. From figure 4, one may reasonably deduce that E.O. sterilization presents increased risk of residual E.O. only to materials with solubility parameters between 9 and 12. A quick look at the list of solubility parameters at the end of this article shows that the range 9 to 12 excludes a large number of important cosmetic materials and packaging materials, including polyethylene (8.5) and polystyrene (8.9). These examples demonstrate the general principle that materials with solubility parameters closer than

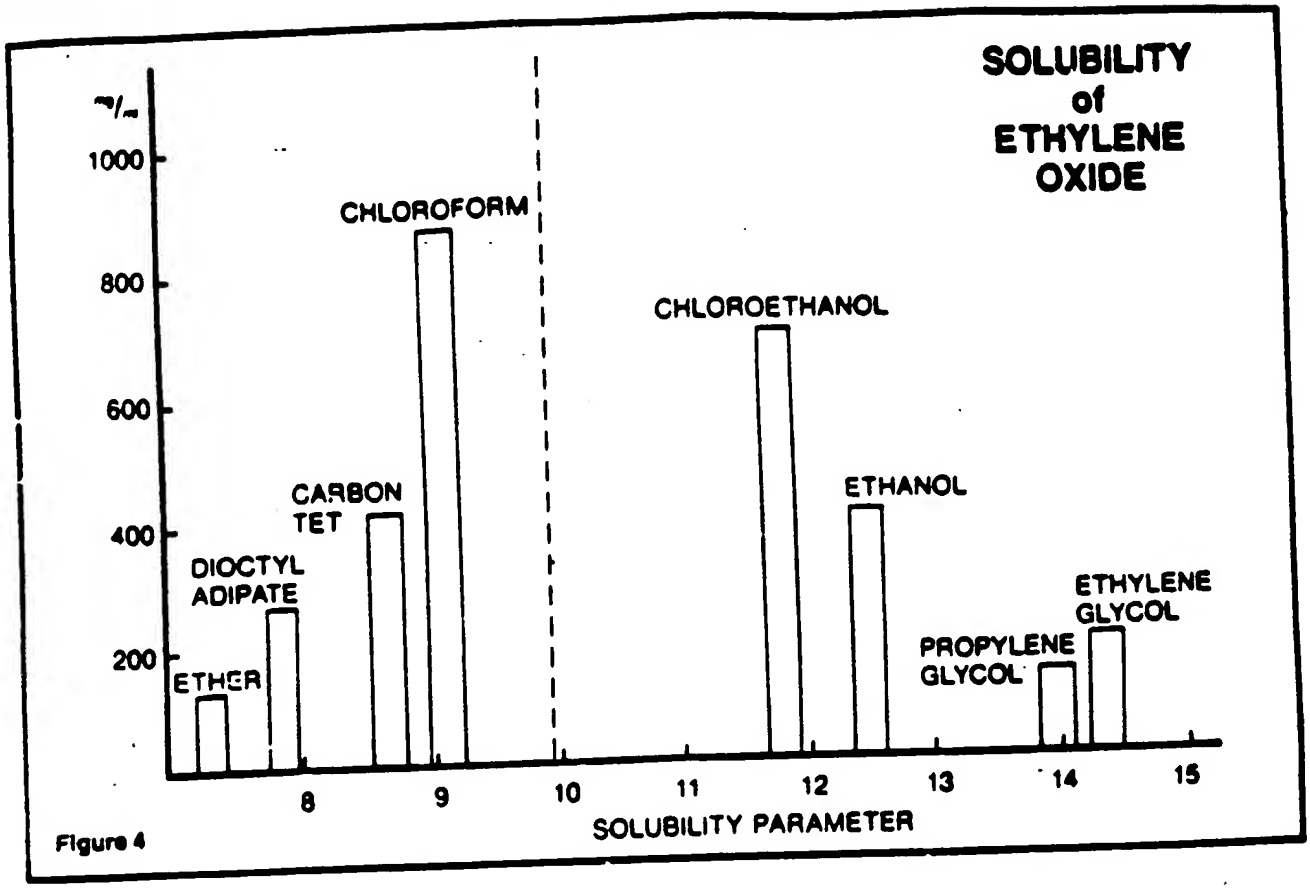

Figure 4

two units apart usually show enhanced solubility, whether you want it (Eosin) or not (E.O.).

Most important, however, is the demonstration that the analysis of solubility data by the solubility parameter permits generalization of specific data. When solubility test results are arranged in order of solubility parameter as was done in Table II,[6] the whole range of miscible materials becomes evident. The table shows that most things with a solubility parameter below 13.0 should accept at least a 5% dilution with dioctyl malate; an unusually wide range of compatibility.

Table II.

Dioctyl Malate Solubility

Solvents (5% at 25°C)		$C_{20}H_{38}O_5$
S.P.*	Ingredients	Solubility
23.40	Water	Insoluble
16.26	Glycerine	Insoluble
15.11	Acetamide MEA	Insoluble
14.00	Propylene Glycol	Dispersible
12.55	Ethanol 100%	Soluble
12.32	Hexylene Glycol	Soluble
10.21	Dioctyl Malate	Soluble
8.02	Isopropyl Myristate	Soluble
7.09	Mineral Oil	Soluble
5.92	Dimethicone	Soluble
5.77	Cyclomethicone	Soluble

* = Solubility Parameters

Product Formulation

Raw material substitution can be made easier using solubility parameters. The solubility parameter of the replacement material can be compared with the original ingredient. A lower number means the replacement is more oil-like. In an emulsion product this means that a lower HLB emulsifier system is needed. The opposite applies if the replacement is less oil-like (more water-like or hydrophilic). Of course if a substitute is used with the same solubility parameter, possibly no other adjustment of the formula is needed. This however is not always the case. The three sources of the molecular attractive field energy are not precisely linearly additive, nevertheless, their combination is usually close enough to linear for effective materials choices.

The Required HLB Equation

Materials for emulsification have been characterized by a value called the "Required HLB."[7] The Required HLB is a number which tells what emulsifiers will work best, and has usually, until now, been determined by a series of experimental tests. The relationship of the solubility parameter to the Required HLB provides comparable answers without the tedious test series. When published values of Required HLB were compared to solubility parameters for the same

materials, the "Required HLB Equation" was uncovered.

$$\text{Req.HLB} = [(SP+7)/8]^4$$

This relationship was not immediately obvious. The initial comparison was widely skewed until we divided the materials into branched and non-branched groups, as shown in figure 5. Long branching in ester molecules appeared to reduce the effectiveness of their full attractive field. This could have been expected since one branch or another of a triglyceride, for example, is going to be aimed the wrong way to exert its full attractive force at any one time. Branching in hydrocarbons is a far more complex phenomenon and results in increased activity. The answer to this apparent anomaly was unraveled by Hildebrand himself[5] at the remarkable age of 91.

The "Required HLB Equation" provides a highly reliable alternative (Correlation Coeff. = .934) to hard work, for all but long branched materials. Short branched isopropyl and ethylhexyl ingredients are accurately predicted by the equation. Finally, it was pleasing to see that this empirical relationship agrees well with the theoretical basis of the solubility parameter. The $(cal/cc)^{\frac{1}{2}}$ units of solubility parameter were originally made square roots so they could be added linearly. The actual field energy is squared (SP^2),

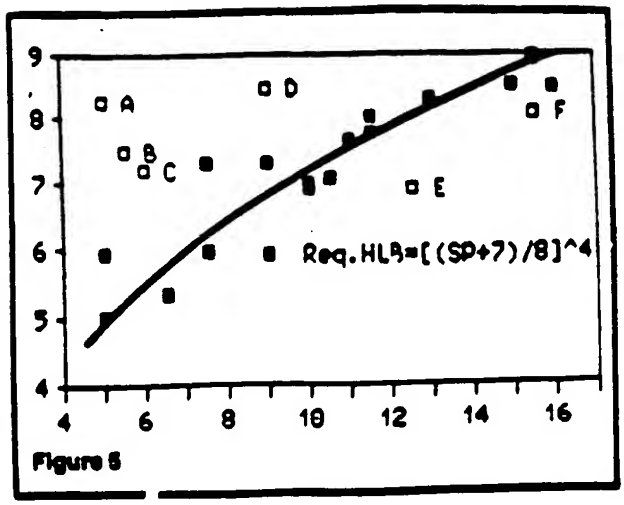

Figure 5

and the product of the interacting fields is expected to be the product of two squares; the fourth power, n^4. This indeed is what was found.

Stability of an emulsion is related to the water attraction or oil attraction of the ingredients and their combination. In every formula of any kind, there is a competition for the most favored locations, then the next most, and the next. The material with the strongest attractive field forces always wins then the next, and the next. Thermodynamic experts call this equilibration. I call it the war of the ingredients. If all the ingredients have about the same power, they interact closely, the formula is compatible and stability prevails. But, bring in one overly strong individual like a salt (assault?) and the other ingredients can't get near it. It will surely go off on its own, and it will come right out of the product. A low energy ingredient, like silicone oil, will conversely be ostracized because it just can't make the necessary energetic connections to avoid the eventual squeezeout. Of course, both salts and silicones have their circles of friends with whom they can be comfortable; and they can be found at either end of the list of solubility parameters.

Package Compatibility

The application of solubility parameters to practical problems was initiated by the coatings and plastics industry. The choice of appropriate additives to plasticize, clarify, and preserve packaging materials was improved by this technique. Again, "like dissolving like" can help any package engineer spot a potential incompatibility. By knowing which raw materials, or formula ingredients are similar to the package composition, an engineer can tell if any of these ingredients might pose a threat to the integrity of the container, cap, liner or pump. An enlightened product development division might even consider telling the formulating chemist what packaging materials are preferred so the product might be initially formulated to avoid incompati-

Table III.

Compatibility of various esters with polystyrene

Ester	Solparam	RXN. Time
Octyl Palmitate	7.44	52 Days
Butyl Myristate	7.68	1 Day
Isopropyl Palmitate	7.78	1 Day
Dioctyl Adipate	7.82	4 Days
Isopropyl Myristate	8.02	1 Day
Methyl Oleate	8.05	1 Day
Dihexyl Adipate	8.06	1 Day
Methyl Linoleate	8.08	1 Day
Methyl Myristate	8.25	5 Hrs.
Methyl Laurate	8.37	4 Hrs.
Methyl Caprate	8.46	3 Hrs.
Diisopropyl Adipate	8.46	2 Hrs.
Dibutyl Adipate	8.65	2 Hrs.
Methyl Caprylate	8.70	2 Hrs.
Methyl Caproate	8.88	1 Hr.
Polystyrene	8.90	---

ble ingredients. Namely ingredients with the same solubility parameter as the packaging material.

I once experienced a terrible cracking episode of polystyrene exterior cream jars with polypropylene inserts. The product was a mentholated facial scrub. The menthol (SP=8.86) traveled through the polypropylene and across the hollow void interior of the jar to attack the polystyrene (SP=8.90) and crack it six months later. I wish I had known about solubility parameters then!

In 1973, Mark Havass and Alan Schuster published a compatibility study of aliphatic esters with polystyrene.[9] Their results are restated in table III with respect to solubility parameters recently published for those esters. The correlation is remarkable.

Preservation

Preservation depends on an adequate preservative delivery system from the product to the micro-organisms. We now know that preservatives must be able to adequately partition from the oil phase to the water phase,[10] and again from the water phase through the microbe cell membrane[11] to provide effective protection against microbial contamination. The partitioning of materials between phases is a function of the competing cohesive forces (i.e. the solubility parameters). If the solubility parameters of the oil phase and preservative are too close, the partitioning will not be sufficient to provide the "reservoir effect," passing additional preservative to the water phase as it is depleted by microbes. For example:

7.00	7.24	9.16	10.84	23.4
Mineral Oil	Peanut Oil	Polysorbate 20	Propylparaben	Water

Mineral oil is too non-polar to hold any appreciable amount of paraben (0.02% = saturation). But peanut (arachis) oil has 100 times the capacity for paraben because it is closer to the paraben solubility parameter. The difference in calories/cc. is small but significant because it is this difference which occurs on the rising slope of the paraben solubility curve shown in figure 6. It is clear from this chart that the solubility of the parabens are the greatest in materials of similar field strength. Peanut oil has just enough attraction to hold the parabens weakly and allow some to partition into the water.

Too much soluble attraction, however, can hold the preservative too strongly, and prevent it from doing its job. This is what happens in the case of the polysorbates. Microbiologists routinely use polysorbate 20 and 80 to inactivate preservatives and allow the culture of bacteria (if any are present) in preserved cosmetic products.[12] The proximity of the solubility parameters of polysorbate 20 and propylparaben are shown previously. However, the field attractions are really much closer than the molecular solubility parameters indicate.

"Chameleonic Solubility" is a term applied over thirty years ago to materials which showed two distinct solubility maxima. The first material of this sort was benzoic acid, however we now know that all surfactants work that way. Polysorbate 20 is no exception. Beerbower[13] and more recently Schott[14] have shown that most surfac-

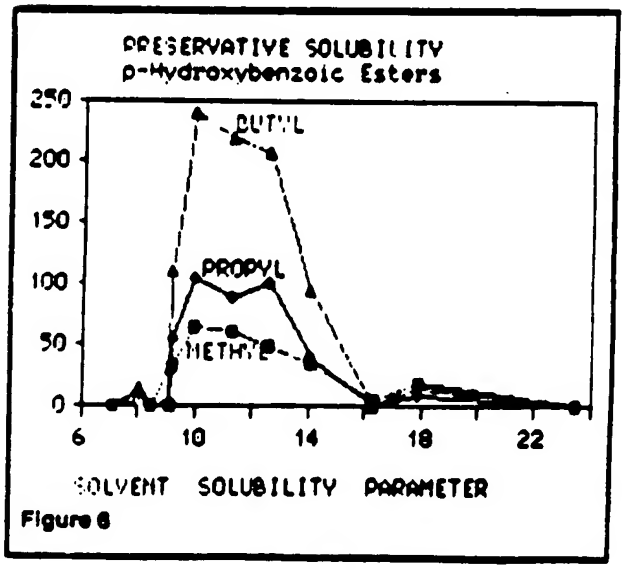

Figure 6

Table IV.

Materials with solubility parameters near skin

Camphor	9.40
Testosterone Proplonate	9.45
Methylene Chloride	9.55
Acetaldehyde	9.61
Undecyl Alcohol	9.61
Amyl DimethylPABA	9.72
Chlorine	9.80
Citronellol	9.88
Ethylene Oxide	9.93
Nitrous Oxide	10.00
Salicylic Acid	10.06
Nicotelne	10.08
Ethyl Cinnamate	10.14
Diethyl Nitrosamine	10.16

tants exhibit two distinct cohesive fields; a strong one at the hydrophilic head and another weak one at the lipophilic tail of the molecule. In the case of polysorbate 20 and many other high ethoxylates, the ethoxylated head has a field strength of 10.95; almost exactly equal to (and inseparable from) propylparaben (10.94).

10.95 — 8.61
20 moles EO——————Sorbitan Laurate
(head) Polysorbate 20 (tail)
9.16

The cohesive, solubility energy appears to be clearly responsible for inactivation of parabens by the polysorbates.

Penetration

Penetration of microbial cell membranes by a series of antimicrobials has been shown to be related to the solubility parameter of microbiocides.[8] Likewise the percutaneous penetration of drugs is expected to show a similar relationship to skin, but not in such a direct and easily predictable manner. Stratum corneum is complex and non-uniform. Although a solubility parameter of porcine stratum corneum has been determined by Limn and Cohen[15] there is good reason to believe that the skin is chameleonic exhibiting perhaps two or maybe three solubility parameters, as suggested by the Meyer-Overton Theory.[16]

Friberg has recently shown that normal skin lipids are anisotropic, and can be structured.[17] Any structure results in the concentration of "like" fields in isolated regions of the microenvironment. This happens to molecules in micelles and liquid crystals. They line up with their polar heads together and can present several channels of different polarity. Observation has shown that many noxious and notorious chemicals have solubility parameters close to the parameters of octanol (10.09). Octanol has long been used as a model for absorption by pharmacists. Its solubility parameter is remarkably close to the value determined for porcine stratum corneum (9.80). Table IV presents a number of materials in this range.

The solubility parameters of the materials above do not, by themselves, indicate that percutaneous absorption is the cause of their activity but it can be expected that absorption may well be the way they achieve their potential.

The Chemistry of Chemistry

Why things dissolve is a topic that has been avoided, skirted, camouflaged, or totally ignored by most college curricula. The chemistry of mixtures remains the realm of only those experienced in the art. This is truly surprising since when we speak of "chemistry," we usually refer to the *interactions of the parts of a mixture*, be it a market, a business, or a social, economic, or physical entity. The "chemistry" of chemistry is just now coming out of the closet. It is responsible for numerous effects and relationships beyond those already mentioned, such as light refraction, reaction solvolysis, chromatographic elution, intrinsic viscosity, cosolubilization, adhesion, thermal expansion, and protein folding, just to name a few.

Formulating chemists and pharmacists are beginning to use solubility parameters to understand mechanisms controlling the chemistry of mixtures. As this new technology becomes more widely accepted, it may eventually become evident to entrenched, academic science that chemistry, like so many other things, is not just reaction but interaction.

References

Address correspondence to Christopher D Vaughan, Ultimate Packaging Inc., 1440 SW 31st Avenue, Pompano Beach, FL 33069 U.S.A.

1. A Dweck, Syneresis in Lipstick, Cosmet & Toiletries, (1985)
2. J. Hildebrand and R. Scott, The Solubility of Nonelectrolytes, 3rd Ed., Reinhold Publ. Corp., New York (1949)
3. C Vaughan, Using Solubility Parameter in Cosmetics Formulation, J. Soc. (Cosmet. Chem., 36, (5), 319 (1985)
4. de Navarre M.G., The Chemistry and Manufacture of Cosmetics, Vol. IV Second Ed. p. 781-782 Allured Publ., Wheaton, IL., (1975)
5. M. Chaigneau, Solubilite de L'Oxyde d'Ethylene, Ann. Pharm Francaises, 43, (2), 193-4 (1985)
6. Ceraphyl 45 – Dioctyl Malate Technical Data Sheet, Van Dyk, Div Mallinckrodt Inc., Belleville, NJ (1987)
7. Emulsification of Cosmetic Ingredients, Publ. No. 102-30, ICI Americas Inc. (1987) Wilmington, DE
8. J. H. Hildebrand, Ind. Eng. Chem. Fundam., 17, 365-6 (1978)
9. M. Havass and A Schuster, A Compatibility Study of Esters, Cosmet. & Toil., 88, (5), 29 (1973)
10. H. B. Kostenbauder, Physical Factors Influencing Antimicrobial Agents, Disinfection Sterilization and Preservation, 2nd Ed., S. Block, Ed., p. 912-3 Lea & Febiger, New York (1983)
11. C. Vaughan, F. Wright, Solubility Parameters and Antimicrobial Activity, Pharm. Acta Helv., 61, (3), 95-96 (1986)
12. M. R. W. Brown and R. M. E. Richards, The Effect of Polysorbate (Tween) 80 on the resistance of Pseudomonas aeruginosa to Chemical Inactivation, J. Pharm. Pharmacol., 16s, 51T-55T (1964)
13. A. Beerbower and M. W. Hill, Application of Cohesive Energy Ratio (CER) Concept to Anionic Surfactants, Am. Cosmet. Perf., 87, 85 (1972)
14. H. Schott, Solubility Parameter and Hydrophilic-Lipophilic Balance of Nonionic Surfactants, J. Pharm. Sci., 73, 790 (1984)
15. G. Lhoest, Use of Physicochemical Parameters to Predict In vivo Diffusion Rate of an Agent, Pharm. Acta. Helv., 48, 549 (1973)
16. B. Idson, Percutaneous Absorption, J. Pharm. Sci., 64, 901-923 (1975)
17. S. Friberg and I Kayali, A Model for the Stratum Corneum Lipids and Some Implications, Cosmet & Toil., 102, (4), 135 (1987)

Solubility Parameters of Cosmetic/Pharmaceutical Materials

by Alphabetical Order

MATERIAL NAME (CTFA)	S.P.	Ref.
Acetaldehyde (21.8)	9.61	A
Acetamide (59.00)	16.03	C
Acetamide MEA	15.11	M
Acetic Acid (6.15)	12.40	CO
Acetic Anhydride (22.40)	10.12	C
Acetohexamide	11.64	*
Acetone (20.70)	9.87	C
Acetonitrile (37.5)	11.81	AO
Acetophenone (17.39)	10.64	C
Acetylacetone	9.68	*
Adipic Acid	13.04	O
Alanine	12.23	J1
Allobarbital	12.85	J1
Almond Oil	8.81	L1
Aminoethyl Ethanolamine	13.18	M
Ammonia (16.90)	16.08	O
Amyl Acetate	8.43	C
Amyl Alcohol (13.90)	10.84	CE
Amyl Dimethyl PABA	9.72	M
p-Anisaldehyde	11.32	A
Arachidic Acid	8.85	M
Arachidyl Alcohol (C20)	8.89	CO
Argon (1.53)	7.00	*M
Aspartic Acid	14.11	J1
Aspergillus Niger	9.00	P
Avocado Oil	8.83	L1
BAL	13.10	B
BHA	12.37	O
BHT	9.17	O
Barbital	13.50	J1
Behenic Acid	7.35	IO
Behenyl Alcohol (C22)	8.63	O
Benzaldehyde (17.80)	11.00	CO
Benzalphthalide	10.90	O*
Benzamide	13.38	B
Benzene (2.28)	9.08	E
Benzocaine	12.05	*
Benzoic Acid (Chameleonic)	11.50	*
Benzyl Alcohol (13.10)	12.31	O
alpha-Bisabolol	9.30	M
Borneol	10.48	C
Bornyl Acetate	8.74	CA
Butadiene Diepoxide	11.78	A
Butalbital	11.95	J1
Butobarbital	11.90	J1
Butoxydiglycol-BuCarbitol	9.98	*
Butoxyethanol (9.30)	10.53	E
Butyl Acetate (5.01)	8.93	CO
Butyl Alcohol (17.51)	11.18	CO
t-Butyl Alcohol (10.90)	10.28	CO
Butyl Lactate	10.27	AO
Butyl Mercaptan	8.65	KA
Butyl Myristate	7.68	D
Butyl Stearate(3.11)	7.68	CO
Butylene Glycol	13.20	CO
Butylparaben	10.57	*
Butyramide	12.33	A
Butyric Acid (2.97)	10.75	E
C12-15 Alcohols Benzoate	7.63	MO
C8-Isoparaffin (1.94)	6.93	MO
Caffeine	13.80	*
Camphor	9.45	C
Candida Albicans	8.90	P
Capric Acid (C10)	8.88	IO
Capric/Caprylic Triglyceride	8.29	L1
Caproamide (C6)	11.24	M
Caproic Acid (C6)(2.83)	10.05	EO
Caprylic Acid (C8)(2.45)	9.32	EO
Carbon Dioxide (1.80)	7.53	M
Carbon Tetrachloride (2.23)	8.84	C
Castor Oil	8.90	M
Cellulose Acetate	11.20	M
Cetane (C16)	7.41	I
Ceteth-20	9.10	M
Cetyl Acetate	8.06	O
Cetyl Alcohol (C16)	8.94	IO
Cetyl Lactate	9.32	M
Cetyl Octanoate	7.59	M
Chlorine	9.80	*M
Chloroform	9.05	A
Cholesterol	9.55	O
Cholesteryl Myristate	8.80	*
Cholesteryl Oleate	7.24	*
Cholesteryl Propionate	8.70	*
Cinnamaldehyde	10.92	C
Cinnamic Acid	11.83	C
Cinnamyl Alcohol	11.96	C
Citronellal	8.83	CO
Citronellol	9.88	A
Coconut Oil	8.10	L1
Cod Liver Oil	7.58	L1

Copper Acetylacetonide	11.60	*
Corn Oil-Refined	7.40	L1
Cottonseed Oil	7.52	L1
Cyclobarbital	12.40	J1
Cyclohexane (2.02)	7.30	E
Cyclomethicone D4 (2.39)	5.99	MO
Cyclomethicone D5 (2.50)	5.77	MO
Cyclopentanone	10.77	E
D&C Red 22 (Eosin)	11.15	L2
Decane (1.99)	7.62	CO
Decanone-2	8.76	A
Decene-1	7.59	C
Decyl Alcohol (C10)(8.10)	9.78	CO
Decyl Oleate	6.92	M
Diacetone Alcohol (18.20)	10.67	CO
Dibutyl Phthalate (6.44)	9.88	M
Dibutylamine	8.15	*
Diethanolamine	13.95	M
Diethyl Amine	7.86	C
Diethyl Ether (4.34)	7.37	CO
Diethyl Ketone (17.00)	8.85	E
Diethyl Nitrosamine	10.18	C
Diethyl Toluamide	10.48	M
Diethylene Glycol (31.70)	13.61	EO
Diethylhexyl Adipate	7.60	M
Diisopropanolamine	12.40	A
Diisopropyl Adipate	8.46	EO
Diisopropyl Amine	8.51	*O
Diisopropyl Ether (3.88)	6.95	KE
Dimethicone	5.92	*O
Dimethyl Isosorbide	9.58	M
Dimethyl Nitrosamine	11.74	C
Dimethyl Sulfoxide (46.68)	13.40	H
p-Dinitrobenzene	12.49	B
Dioctyl Adipate	7.82	M
Dioctyl Ether	7.30	A
Dioctyl Malate	10.21	M
Dioctyl Maleate	7.75	O
Dioxane (2.21)	10.01	*
Dipropyl Ketone	8.89	C
Dipropyl Nitrosamine	9.29	B
Dipropylene Glycol (PPG-2)	11.78	M
Docosane (C22)	6.60	I
Dodecane (2.01) (7.85-1)	7.59	C
Eicosane (C20)	7.32	C
Elaidyl Alcohol	8.90	CO
Erucic Acid	7.57	CO
Erythritol	16.06	*
Ethanedithiol	10.87	A
Ethanolamine (37.72)	15.41	*M
Ethoxyethanol (29.60)	9.90	*M
Ethyl Acetate (6.02)	9.19	CO
Ethyl Acrylate	9.22	A
Ethyl Alcohol (24.30)	12.55	CO
Ethyl Anthranilate	10.87	C
Ethyl Benzoate (6.02)	10.01	C
Ethyl Caprate (C10)	8.39	A
Ethyl Caproate (C6)	8.69	A
Ethyl Caprylate (C8)	8.57	A
Ethyl Cinnamate	10.14	A
Ethyl Dihydroxypropyl PABA	12.42	M
Ethyl Hexanediol	10.89	A
Ethyl Mercaptan	8.75	K
Ethyl Myristate	8.00	C
Ethyl Oleate (3.17)	8.60	*
Ethylene Glycol (37.00)	14.50	CO
Ethylene Oxide (13.90)	9.93	A
Ethylene/Vinyl Acetate(AC400)	8.55	*O
Ethylene/Vinyl Acetate(AC430)	9.55	*O
Ethylhexanol	9.80	A
Eucalyptol (Cineole)	8.17	L1
Eugenol	11.12	C
Formaldehyde	10.54	C
Formamide (109.0)	17.82	E
Formic Acid (58.5)	14.72	E
Frog Synaptic Nerve	11.60	*
Geraniol	10.21	CO
Glutathione	13.18	G
Glycerin (42.50)	16.26	EO
Glyceryl Isostearate	8.31	J3
Glyceryl Stearate (mono)	8.31	*O
Glyceryl Stearate SE	8.43	J3
Glycol Distearate	8.24	J3
Glycol Stearate	8.28	J3
Glyoxal	11.48	C
Gold	93.00	*M
Griseofulvin	10.20	M
Helium (1.06)	0.50	*M
Heptane (1.92)	7.41	CO
Hexamethyldisiloxane (2.17)	6.15	MO
Hexane (1.88)	7.28	CO
Hexobarbital	11.30	J1
Hexyl Alcohol (13.30)	10.50	IO
Hexyl Resorcinol	14.06	*
Hexylene Glycol	12.32	*
Histidine	15.25	J1
Homosalate	10.29	GM
Human Erythrocyte	8.05	*
Human Serum Albumin A	12.33	J1
Hydrogen (1.23)	2.50	*M
Hydroquinone	14.62	
Hydroxyanisole	12.00	C
p-Hydroxybenzoic Acid	15.30	*
Iodine (11.00)	14.10	*M
beta-Ionone	8.90	CO
Isobutyl Stearate	7.65	O
Isocetyl Alcohol	8.71	M
Isocetyl Stearate	6.19	M
Isodecyl Oleate	7.17	M
Isopentane	6.82	CO
Isopropanolamine	13.02	A
Isopropyl Alcohol (18.30)	11.24	CO
Isopropyl Linoleate	7.55	M
Isopropyl Myristate	8.02	O
Isopropyl Palmitate	7.78	O
Isopropylbenzene (2.38)	8.60	*
Isosteareth-2	8.29	L1
Isostearic Acid	8.09	O
Isostearyl Alcohol	8.67	O
Isostearyl Neopentanoate	7.43	M
Klebsiella Pneumoniae	9.40	P
Lactic Acid (22.00)	14.81	
Lactose	19.50	*
Lanolin Oil	7.33	L1
Lauraldehyde	8.68	A
Laureth-4	8.31	J3
Lauric Acid (C12)	8.46	IO
Lauryl Alcohol (C12)	9.31	CO
Lauryl Lactate	9.16	M
Limonene (2.30)	8.33	C
Linalool	9.62	C
Linolenic Acid	7.86	CO
Linseed Oil	7.29	*O
Lysine	11.79	J1
MEK(18.50) 9.53A	9.63	CO
Magnesium	50.00	*M
Melene (C30)	6.58	C
Melissyl Alcohol (C30)	8.22	CO
Menthol	9.94	CO
Menthyl Anthranilate	9.89	M
Mercaptoethanol	13.55	A
Mercury	31.00	*M
Mercury Iodide	16.04	*M
Methane (1.70)	4.70	*O
Methoxyethanol (16.90)	10.80	*
Methoxypropanol	10.40	*
Methyl Alcohol (32.70)	14.33	CO
Methyl Anthranilate	11.22	C
Methyl Benzoate (6.59)	10.48	E
Methyl Butyl Ketone	9.11	E
Methyl Butyl Methacrylate CO	9.10	M
Methyl Caproate (C6)	8.66	B
Methyl Heptyl Ketone	8.86	A
Methyl Hexyl Ketone	8.91	A

Methyl Iodide	9.75	C
Methyl Isobutyl Ketone(14.70)	8.85	EO
Methyl Lactate	11.47	CO
Methyl Linoleate	8.08	C
Methyl Methacrylate Copolymer	9.40	H
Methyl Oleate (3.21)	8.05	CO
Methyl Propyl Ketone	9.27	C
Methyl Salicylate (9.41)	10.62	CO
Methylene Chloride (9.08)	9.55	E
Methylparaben	11.98	O
Morpholine (7.33)	10.28	C
Muscone	8.89	CO
Myristic Acid (C14)	8.10	IO
Myristyl Alcohol (C14)	9.16	IO
Myristyl Lactate	8.87	M
N-Methylpyrrolidone	11.71	A
Napthylene	10.74	B
Natural Rubber	8.20	M
Neon	4.90	*N
Neopentane	6.38	CO
Nerol	10.13	C
Nicoteine	10.08	C
Nicotine	9.40	C
m-Nitroaniline	13.23	C
o-Nitroaniline (34.50)	12.88	D
p-Nitroaniline (56.30)	13.67	A
Nitrocellulose	11.25	MO
Nitrogen (1.45)	5.90	*N
Nitromethane	12.27	C
o-Nitrotoluene (27.40)	10.55	B
p-Nitrotoluene (24.20)	11.83	
Nitrous Oxide (1.60)	10.00	*M
Nonacosane (C29)	6.83	C
Nonoxynol-1	10.47	*
Octadecane (C18)	7.29	C
Octanal	8.77	C
Octane (1.95)	7.58	MO
Octanol/Caprylic(C8) (10.34)	10.09	CO
Octyl Acetate	8.58	A
Octyl Dimethyl PABA 9.34G	9.01	OM
Octyl Dodecanol	8.92	OM
Octyl Fluoride	7.76	AG
Octyl Iodide	8.58	A
Octyl Mercaptan	8.36	K
Octyl Methoxycinnamate	9.10	M
Octyl Palmitate	7.44	O
Octyl Salicylate	10.17	M
Octylamine	8.21	A
Oleic Acid(2.46)	7.91	IO
Oleth-3	7.83	*O
Oleyl Alcohol	8.95	CO
Olive Oil	7.87	*O
Oxidized Polyethylene (AC392)	9.50	*O
Oxidized Polyethylene (AC629)	8.85	*O
Oxygen (1.50)	7.20	*N
PABA 14.56G	14.82	DO
PEG-100 Stearate	9.35	J3
PEG-2 Stearate	8.36	J3
PEG-20 Stearate	9.08	J3
PEG-4 Stearate	7.92	O
PEG-4(20.44)	11.61	DO
PEG-40 Stearate	9.18	J3
PEG-5 (18.16)	11.54	DO
PEG-6 (16.00)	11.47	DO
PEG-8	11.34	MO
PPG-2 Methyl Ether	9.60	*
PPG-2 Myristyl Ether	8.29	L1
PPG-4	9.89	M
Palmitic Acid (C16) (22.30)	7.89	IO
Panthenol	11.39	MO
Peanut Oil	7.24	L1
Pentaerythritol Tetraoleate	7.98	L1
Pentane	7.10	*O
Pentobarbital	11.75	J1
Perfluoroctane	5.72	A
Perfluorodecalin	6.34	A
Perfluorohexane	5.68	A
Petrolatum	7.33	*O
Phenethyl Alcohol	11.79	CO
Phenobarbital	13.00	J1
Phenol (9.78)	12.79	CE
Phenoxyethanol	11.87	CO
Phenyl Acetate (5.23)	10.33	E
Phenylalanine	11.57	G
Phenylbutanol	11.04	A
o-Phenylene Diamine	12.43	D
Phenylpentanol	10.74	A
Phenylpropanol	11.46	A
Phthalide	11.78	C
Polyeth. Terephthalate (PET)	10.30	*
Polyethylene (2.35)	8.50	*O
Polyglyceryl-3 Oleate	8.52	J3
Polysorbate-20	9.16	J3
Polystyrene	8.90	M
Polytetrafluoroethylene	6.20	*
Potassium	21.00	*
Pristane	6.85	MO
Propane	6.21	*O
Propargyl Alcohol	13.61	A
Propellant 11 (2.28)	7.49	O
Propellant 113	7.19	H
Propellant 12(2.13)	6.11	*O
Propellant 13	2.59	*O
Propellant 22(6.11)	6.23	MO
Propiolactone	13.56	A
Propionaldehyde	9.22	A
Propionamide	13.46	AL
Propionic Acid (3.35)	11.40	EA
Propionitrile	10.57	A
Propyl Acetate	9.02	CO
Propyl Alcohol (20.10)	11.73	CO
Propyl Fluoride	7.48	C
Propylene Carbonate (69.00)	13.35	*
Propylene Glycol (32.00)	14.00	CO
Propylene Glycol Dipelargona	8.21	L1
Propylene Glycol Laurate	8.33	L1
Propylene Oxide	8.99	A
Propylparaben	10.94	GM
Pseudomonas Aueriginosa	9.90	P
Pulegone	9.51	A
Pyridine (12.3)	10.30	A
Pyrogallol	15.41	A
Pyrrolidinone-2	14.22	
Pyrrolidone	14.00	*
Pyruvic Acid	12.94	*
Radon	8.40	*N
Rat Gut Membrane	12.60	*
Resorcinol	14.98	C
Rice Oil - SO	7.48	L1
Ricinoleic Acid	8.30	C
SAN (65/15)	10.50	*
Safflower Oil	6.42	L1
Salicylic Acid	10.06	C
Secobarbital	11.30	J1
Sodium	33.00	*N
Sodium Capryl Sulfate 14.84	15.80	*
Sodium Lauryl Sulfate	14.18	*
Sorbic Acid	11.97	MO
Sorbitan Laurate	8.61	O
Sperm Oil	7.09	*O
Squalane	6.03	MO
Squalene	6.19	MO
Staphylococcus Aureus	8.30	P
Stearic Acid (C18) (2.30)	7.74	IO
Stearyl Alcohol (C18)	8.90	IO
Stratum Corneum-Porcine	9.80	*
Sulfadiazine	11.90	*
Sulfamerazine	13.40	J1
Sulfameter	13.90	J1
Sulfamethazine	12.60	J1
Sulfamethoxazole	11.60	J1
Sulfathiazole	13.10	*
Sulfisomidine	12.70	J1
Sulfisomidine	12.80	*

Ref. J Pharm. Sci. 8.847

Sulfur (3.55)	12.70	*M
THF (7.58)	9.16	E
Testosterone	10.90	*
Tetraethyl Lead	7.92	E
Theophyllin	14.00	*
Thiodiglycol	13.80	M
Thioglycolic Acid	13.88	A
Thiolacetic Acid	10.38	A
alpha-Thujone	8.94	A
Thymol	10.77	C
Titanium Dioxide	16.82	*
Titanium Isopropoxide	8.21	M
Tocopherol	9.17	M
Tocopheryl Acetate	7.98	M
Tolbutamide	10.98	*
Toluene (2.38)	8.94	C
Triacetin	10.77	O
Tributyl Citrate	9.20	M
Tributyrin	9.97	O
Trichloroacetic Acid	10.89	L
Trichomonas Ment.	9.30	P
Tricosane (C22)	7.13	C
Tridecane (C13)	7.48	CO
Tridecyl Neopentanoate	7.92	LI
Triethanolamine (29.38)	13.28	MO
Triethylene Glycol (23.69)	12.21	MO
Trifluoroacetylacetone	8.77	A
Triisopropanolamine	11.02	M
Trimethyl Citrate	9.39	M
Tripropylene Glycol (PPG-3)	10.60	M
Tungsten	145.00	*M
Turpentine (pinene)(2.70)	8.03	CO
Undecyl Alcohol	9.61	CO
Urea	14.50	G
Valeric Acid (C5)	10.29	A
Valine	10.94	JI
Vanillin	12.34	O
Water (80.10)	23.40	CM
White Mineral Oil	7.09	*O
Zinc Stearate	8.80	O

Solubility Parameters of Coemetic/Pharmaceutical Materials

by Solvent Strength

MATERIAL NAME (CTFA) with Dielectric Const.	S.P.	Ref.
Helium (1.06)	0.50	*M
Hydrogen (1.23)	2.50	*M
Propellant 13	2.59	*O
Methane (1.70)	4.70	*O
Neon	4.90	*M
Perflunrohexane	5.68	A
Perfluoroctane	5.72	A
Cyclomethicone D5 (2.50)	5.77	MO
Nitrogen (1.45)	5.90	*M
Dimethicone	5.92	*O
Cyclomethicone D4 (2.39)	5.99	MO
Squalane	6.03	MO
Propellant 12(2.13)	6.11	*O
Hexamethyldisiloxane (2.17)	6.15	MO
Isocetyl Stearate	6.19	M
Squalene	6.19	MO
Polytetrafluoroethylene	6.20	*
Propane	6.21	*O
Propellant 22(8.11)	6.23	MO
Perfluorodecalin	6.34	A
Neopentane	6.38	CO
Safflower Oil	6.42	LI
Malene (C30)	6.58	C
Docosane (C22)	6.60	I
Almond Oil	6.81	LI
Isopentane	6.82	CO
Avocado Oil	6.83	LI
Nonacosane (C29)	6.83	C
Arachidic Acid	6.85	M
Pristane	6.85	MO
Decyl Oleate	6.92	M
C8-Isoparaffin (1.94)	6.93	MO
Diisopropyl Ether (3.88)	6.95	KE
Argon (1.53)	7.00	*M
Sperm Oil	7.09	*O
White Mineral Oil	7.09	*O
Pentane	7.10	*O
Tricosane (C22)	7.13	C
Isodecyl Oleate	7.17	M
Propellant 113	7.19	M
Oxygen (1.50)	7.20	*M
Cholesteryl Oleate	7.24	*
Peanut Oil	7.24	LI
Hexane (1.88)	7.28	CO
Linseed Oil	7.29	*O
Octadecane (C18)	7.29	C
Cyclohexane (2.02)	7.30	E
Dioctyl Ether	7.30	A
Eicosane (C20)	7.32	C
Lanolin Oil	7.33	LI
Petrolatum	7.33	*O
Behenic Acid	7.35	IO
Diethyl Ether (4.34)	7.37	CO
Corn Oil-Refined	7.40	LI
Cetane (C16)	7.41	I
Heptane (1.92)	7.41	CO
Isostearyl Neopentanoate	7.43	M
Octyl Palmitate	7.44	O
Propyl Fluoride	7.48	C
Rice Oil - SO	7.48	LI
Tridecane (C13)	7.48	CO
Propellant 11 (2.28)	7.49	O
Cottonseed Oil	7.52	LI
Carbon Dioxide (1.60)	7.53	M
Isopropyl Linoleate	7.55	M
Cod Liver Oil	7.56	LI
Erucic Acid	7.57	CO
Octane (1.95)	7.58	MO
Cetyl Octanoate	7.59	M
Decene-1	7.59	C
Dodecane (2.01) (7.65-1)	7.59	C
Diethylhexyl Adipate	7.60	M
Decane (1.99)	7.62	CO
C12-15 Alcohols Benzoate	7.63	MO
Isobutyl Stearate	7.65	O
Butyl Myristate	7.68	O
Butyl Stearate(3.11)	7.68	CO
Stearic Acid (C18) (2.30)	7.74	IO
Dioctyl Maleate	7.75	O
Octyl Fluoride	7.76	A6
Isopropyl Palmitate	7.78	O
Dioctyl Adipate	7.82	M
Oleth-3	7.83	*O
Diethyl Amine	7.86	C
Linolenic Acid	7.86	CO
Olive Oil	7.87	*O
Palmitic Acid (C16) (22.30)	7.89	IO
Oleic Acid(2.46)	7.91	IO
PEG-4 Stearate	7.92	O
Tetraethyl Lead	7.92	E
Tridecyl Neopentanoate	7.92	LI
Pentaerythritol Tetraoleate	7.98	LI
Tocopheryl Acetate	7.98	M
Ethyl Myristate	8.00	C

Isopropyl Myristate	8.02	O
Turpentine (pinene)(2.7*)	8.03	CO
Human Erythrocyte	8.05	*
Methyl Oleate (3.21)	8.05	CO
Cetyl Acetate	8.06	O
Methyl Linoleate	8.08	C
Isostearic Acid	P.09	O
Coconut Oil	8.10	L1
Myristic Acid (C14)	8.10	IO
Dibutylamine	8.15	*
Eucalyptol (Cineole)	8.17	L1
Natural Rubber	8.20	H
Octylamine	8.21	A
Propylene Glycol Dipelargone	8.21	L1
Titanium Isopropoxide	8.21	M
Melissyl Alcohol (C30)	8.22	CO
Glycol Distearate	8.24	J3
Glycol Stearate	8.28	J3
Capric/Caprylic Triglyceric	8.29	L1
Isostearath-2	8.29	L1
PPG-2 Myristyl Ether	8.29	L1
Ricinoleic Acid	8.30	C
Staphylococcus Aureus	8.30	P
Glyceryl Isostearate	8.31	J3
Glyceryl Stearate (mono)	8.31	*O
Laureth-4	8.31	J3
Limonene (2.30)	8.33	C
Propylene Glycol Laurate	8.33	L1
Octyl Mercaptan	8.36	K
PEG-2 Stearate	8.38	J3
Ethyl Caprate (C10)	8.39	A
Radon	8.40	*M
Amyl Acetate	8.43	C
Glyceryl Stearate SE	8.43	J3
Diisopropyl Adipate	8.46	EO
Lauric Acid (C12)	8.48	IO
Polyethylene (2.35)	8.50	*O
Diisopropyl Amine	8.51	*O
Polyglyceryl-3 Oleate	8.52	J3
Ethylene/Vinyl Acetate(AC400)	8.55	*O
Ethyl Caprylate (C8)	8.57	A
Octyl Acetate	8.58	A
Octyl Iodide	8.58	A
Ethyl Oleate (3.17)	8.60	*
Isopropylbenzene (2.38)	8.60	*
Sorbitan Laurate	8.61	O
Behenyl Alcohol (C22)	8.63	IO
Carbon Tetrachloride (2.23)	8.64	C
Butyl Mercaptan	8.65	KA
Isostearyl Alcohol	8.67	O
Lauraldehyde	8.68	A
Ethyl Caproate (C8)	8.69	A
Cholesteryl P-opionate	8.70	*
Isocetyl Alcohol	8.71	M
Bornyl Acetate	8.74	CA
Ethyl Mercaptan	8.75	K
Decanone-2	8.76	A
Octanal	8.77	C
Trifluoroacetylacetone	8.77	A
Cholesteryl Myristate	8.80	*
Zinc Stearate	8.80	O
Citronellal	8.83	CO
Diethyl Ketone (17.00)	8.85	E
Methyl Isobutyl Ketone(14.70)	8.85	EO
Oxidized Polyethylene (AC629)	8.85	*O
Methyl Heptyl Ketone	8.86	A
Myristyl Lactate	8.87	M
Capric Acid (C10)	8.88	IO
Methyl Caproate (C8)	8.88	B
Arachidyl Alcohol (C20)	8.89	CO
Dipropyl Ketone	8.89	C
Muscone	8.89	CO
Candida Albicans	8.90	P
Castor Oil	8.90	H
Elaidyl Alcohol	8.90	CO
beta-Ionone	8.90	CO
Polystyrene	8.90	M
Stearyl Alcohol (C18)	8.90	IO
Methyl Hexyl Ketone	8.91	A
Octyl Dodecanol	8.92	OM
Butyl Acetate (5.01)	8.93	CO
Cetyl Alcohol (C16)	8.94	IO
alpha-Thujone	8.94	A
Toluene (2.38)	8.94	C
Oleyl Alcohol	8.95	CO
Propylene Oxide	8.99	A
Aspergillus Niger	9.00	P
Octyl Dimethyl PABA 9.346	9.01	OM
Propyl Acetate	9.02	CO
Chloroform	9.05	A
Benzene (2.28)	9.08	E
PEG-20 Stearate	9.08	J3
Ceteth-20	9.10	H
Methyl Butyl Methacrylate CO	9.10	M
Octyl Methoxycinnamate	9.10	M
Methyl Butyl Ketone	9.11	E
Myristyl Alcohol (C14)	9.16	IO
Polysorbate-20	9.16	J3
THF (7.58)	9.16	E
BHT	9.17	D
Tocopherol	9.17	M
Lauryl Lactate	9.18	M
PEG-40 Stearate	9.18	J3
Ethyl Acetate (8.02)	9.19	CO
Tributyl Citrate	9.20	M
Ethyl Acrylate	9.22	A
Propionaldehyde	9.22	A
Methyl Propyl Ketone	9.27	C
Dipropyl Nitrosamine	9.29	B
alpha-Bisabolol	9.30	M
Pseudomonas Aueriginosa	9.30	P
Trichamonas Hent.	9.30	P
Caprylic Acid (C8)(2.45)	9.32	EO
Cetyl Lactate	9.32	M
PEG-100 Stearate	9.35	J3
Trimethyl Citrate	9.39	M
Klebsiella Pneumoniae	9.40	P
Methyl Methacrylate Copolymer	9.40	M
Nicotine	9.40	C
Camphor	9.45	C
Oxidized Polyethylene (AC392)	9.50	*O
Lauryl Alcohol (C12)	9.51	CO
Pulegone	9.51	*
Cholesterol	9.55	O
Ethylene/Vinyl Acetate(AC430)	9.55	*O
Methylene Chloride (9.08)	9.55	E
Dimethyl Isosorbide	9.58	M
PPG-2 Methyl Ether	9.60	*
Acetaldehyde (21.8)	9.61	A
Undecyl Alcohol	9.61	CO
Linalool	9.62	C
MEK(18.50) 9.53A	9.63	CO
Acetylacetone	9.68	*
Amyl Dimethyl PABA	9.72	M
Methyl Iodide	9.75	C
Decyl Alcohol (C10)(8.10)	9.78	CO
Chlorine	9.80	*M
Ethylhexanol	9.80	A
Stratum Corneum-Porcine	9.80	*
Acetone (20.70)	9.87	C
Citronellol	9.88	A
Dibutyl Phthalate (6.44)	9.88	M
Menthyl Anthranilate	9.89	M
PPG-4	9.89	M
Ethoxyethanol (29.60)	9.90	*M
Ethylene Oxide (13.90)	9.93	A
Menthol	9.94	CO
Tributyrin	9.97	O
Butoxydiglycol-BuCarbitol	9.98	*
Nitrous Oxide (1.60)	10.00	*M
Dioxane (2.21)	10.01	*
Ethyl Benzoate (8.02)	10.01	C
Caproic Acid (C8)(2.83)	10.05	EO
Salicylic Acid	10.08	C

Nicotaine	10.08	C
Octanol/Caprylic(C8) (10.34)	10.09	CO
Acetic Anhydride (22.40)	10.12	C
Nerol	10.13	C
Ethyl Cinnamate	10.14	A
Diethyl Nitrosamine	10.16	C
Octyl Salicylate	10.17	M
Griseofulvin	10.20	M
Dioctyl Malate	10.21	M
Geraniol	10.21	CO
Butyl Lactate	10.27	AO
t-Butyl Alcohol (10.90)	10.28	CO
Morpholine (7.33)	10.28	C
Homosalate	10.29	GM
Valeric Acid (C5)	10.29	A
Polyeth. Terephthalate (PET)	10.30	*
Pyridine (12.3)	10.30	A
Phenyl Acetate (5.23)	10.33	E
Thiolacetic Acid	10.38	A
Methoxypropanol	10.40	*
Diethyl Toluamide	10.46	M
Nonoxynol-1	10.47	*
Borneol	10.48	C
Methyl Benzoate (8.59)	10.48	E
Hexyl Alcohol (13.30)	10.50	IO
SAN (85/15)	10.50	*
Butoxyethanol (9.30)	10.53	E
Formaldehyde	10.54	C
o-Nitrotoluene (27.40)	10.55	B
Butylparaben	10.57	*
Propionitrile	10.57	A
Tripropylene Glycol (PPG-3)	10.60	M
Methyl Salicylate (9.41)	10.62	CO
Acetophenone (17.39)	10.64	C
Diacetone Alcohol (18.20)	10.67	CO
Ethyl Anthranilate	10.67	C
Napthylene	10.74	B
Phenylpentanol	10.74	A
Butyric Acid (2.97)	10.75	E
Cyclopentanone	10.77	E
Thymol	10.77	C
Triacetin	10.77	O
Methoxyethanol (16.90)	10.80	*
Amyl Alcohol (13.90)	10.84	CE
Ethanedithiol	10.87	A
Ethyl Hexanediol	10.89	A
Trichloroacetic Acid	10.89	E
Benzalphthalide	10.90	O*
Testosterone	10.90	*
Cinnamaldehyde	10.92	C
Propylparaben	10.94	GM
Valine	10.94	JI
Tolbutamide	10.98	*
Benzaldehyde (17.80)	11.00	CO
Triisopropanolamine	11.02	M
Phenylbutanol	11.04	A
Eugenol	11.12	C
D&C Red 22 (Eosin)	11.15	L2
Butyl Alcohol (17.51)	11.18	CO
Cellulose Acetate	11.20	M
Methyl Anthranilate	11.22	C
Caproamide (C6)	11.24	M
Isopropyl Alcohol (18.30)	11.24	CO
Nitrocellulose	11.25	MO
Hexobarbital	11.30	JI
Secobarbital	11.30	JI
p-Anisaldehyde	11.32	A
PEG-8	11.34	MO
Panthenol	11.39	MG
Propionic Acid (3.35)	11.40	EA
Glyoxal	11.46	C
Phenylpropanol	11.46	A
Methyl Lactate	11.47	CO
PEG-6 (16.00)	11.47	DO
Benzoic Acid (Chameleonic)	11.50	*
PEG-5 (18.16)	11.54	DO
Phenylalanine	11.57	G
Copper Acetylacetonate	11.60	*
Frog Synaptic Nerve	11.60	*
Sulfamethoxazole	11.60	JI
PEG-4(20.44)	11.61	DO
Acetohexamide	11.64	*
N-Methylpyrrolidone	11.71	A
Propyl Alcohol (20.10)	11.73	CO
Dimethyl Nitrosamine	11.74	C
Pentobarbital	11.75	JI
Butadiene Diepoxide	11.78	A
Dipropylene Glycol (PPG-2)	11.78	M
Phthalide	11.78	C
Lysine	11.79	JI
Phenethyl Alcohol	11.79	CO
Acetonitrile (37.5)	11.81	AO
Cinnamic Acid	11.83	C
p-Nitrotoluene (24.20)	11.83	
Phenoxyethanol	11.87	CO
Butobarbital	11.90	JI
Sulfadiazine	11.90	*
Butalbital	11.95	JI
Cinnamyl Alcohol	11.96	C
Sorbic Acid	11.97	MO
Methylparaben	11.98	O
Hydroxyanisole	12.00	C
Benzocaine	12.05	*
Triethylene Glycol (23.68)	12.21	MO
Alanine	12.23	JI
Nitromethane	12.27	C
Benzyl Alcohol (13.10)	12.31	O
Hexylene Glycol	12.32	*
Butyramide	12.33	A
Human Serum Albumin A	12.33	JI
Vanillin	12.34	D
BHA	12.37	O
Acetic Acid (8.15)	12.40	CO
Cyclobarbital	12.40	JI
Diisopropanolamine	12.40	A
Ethyl Dihydroxypropyl PABA	12.42	M
o-Phenylene Diamine	12.43	D
p-Dinitrobenzene	12.49	B
Ethyl Alcohol (24.30)	12.55	CO
Rat Gut Membrane	12.60	*
Sulfamethazine	12.60	JI
Sulfisomidine	12.70	JI
Sulfur (3.55)	12.70	*M
Phenol (9.78)	12.79	CE
Sulfisomidine	12.80	*
Allobarbital	12.85	JI
o-Nitroaniline (34.50)	12.88	O
Pyruvic Acid	12.94	*
Phenobarbital	13.00	JI
Isopropanolamine	13.02	A
Adipic Acid	13.04	O
BAL	13.10	B
Sulfathiazole	13.10	*
Aminoethyl Ethanolamine	13.18	M
Glutathione	13.18	G
Butylene Glycol	13.20	CO
m-Nitroaniline	13.23	C
Triethanolamine (29.36)	13.28	MO
Propylene Carbonate (69.00)	13.35	*
Benzamide	13.38	B
Dimethyl Sulfoxide (46.68)	13.40	M
Sulfamerazine	13.40	JI
Propionamide	13.46	AC
Barbital	13.50	JI
Mercaptoethanol	13.55	A
Propiolactone	13.56	A
Diethylene Glycol (31.70)	13.61	EO
Propargyl Alcohol	13.61	A
p-Nitroaniline (56.30)	13.67	A
Caffeine	13.80	*
Thiodiglycol	13.80	M
Thioglycolic Acid	13.86	A
Sulfameter	13.90	JI
Diethanolamine	13.95	M

Propylene Glycol (32.00)	14.00	CO	
Pyrrolidone	14.00	*	
Theophyllin	14.00	*	
Hexyl Resorcinol	14.06	*	
Iodine (11.00)	14.10	*N	
Aspartic Acid	14.11	J1	
Sodium Lauryl Sulfate	14.18	*	
Pyrrolidinone-2	14.22		
Methyl Alcohol (32.70)	14.33	CO	
Ethylene Glycol (37.00)	14.50	CO	
Urea	14.50	G	
Hydroquinone	14.62		
Formic Acid (58.5)	14.72	E	
Lactic Acid (22.00)	14.81		
PABA 14.566	14.82	OO	
Resorcinol	14.96	C	
Acetamide MEA	15.11	M	
Histidine	15.25	J1	
p-Hydroxybenzoic Acid	15.30	*	
Ethanolamine (37.72)	15.41	*M	
Pyrogallol	15.41	A	
Sodium Capryl Sulfate 14.84	15.80	*	
Acetamide (59.00)	16.03	C	
Mercury Iodide	16.04	*M	
Erythritol	16.06	*	
Glycerin (42.50)	16.26	EO	
Titanium Dioxide	16.82	*	
Formamide (109.0)	17.82	E	
Ammonia (16.90)	18.08	O	
Lactose	19.50	*	
Potassium	21.00	*	
Water (80.10)	23.40	CN	
Mercury	31.00	*N	
Sodium	33.00	*N	
Magnesium	50.00	*N	
Gold	93.00	*N	
Tungsten	145.00	*N	

NOTE: * = Solubility Parameter value from literature

SOURCE of Physical Data:

A. Aldrich Chemical Co. Catalog 1966 gram
B. Beilstein's Index
C. Chemical Rubber Handbook of Chem.& Physics 42d Ed. (1961-1962)
D. Dictionary of Organic Compounds
E. Eastman Organic Chemical Bulletin 47, No.1,1975
F. Fisher Scientific Catalog - 1966
G. Group Contribution Method of Hoy, Van Krevelen and Feodors.
H. HANDBOOK OF SOLUBILITY PARAMETERS, A.M. Barton, Chemikcal Rubber Publ.1985
I. INDUSTRIAL WAXES. H. Bennett, Chemical Pub. Co.
J. Journal Reference by number J(x).
J1-J. Pharm. Sci.75, (7), 639
J2-Pharm Acta Helv.,48,549 (1973)
J3-Am.Cosmet.Perf.,87,p.65 (1972)
K. Kolthoff & Elving, TREATISE on ANYALYTICAL CHEMISTRY
L. Laboratory Determination By:
L(1)-Consolbillizer Study
L(2)-Solubility Study Unpublished
M. Manufacturer's Physical Data by Personal Communication.
N. NONELECTROLYTES, THE SOLUBILITY of: Hildebrand & Scott, Dover Press
O. Original pbulished values JSCC 36,319
P. Pharm. Acta Helv. 61,(3),95 Antimicrobial Activity and Selparens-C.V./F.W.